

1 1. A dryer for drying vegetable product, such as
2 coffee beans, comprising:
3 a thermal collector constructed and arranged to
4 convert solar energy to heat energy;
5 a heat transfer system;
6 a housing having a drying chamber; and
7 wherein said heat transfer system is in thermal
8 communication with both said thermal collector and said
9 drying chamber such that heat is able to move from said
10 thermal collector to said drying chamber.

1 2. The dryer of claim 1 further comprising a
2 photovoltaic module constructed and arranged to provide
3 electrical power to said heat transfer system, said
4 photovoltaic module being electrically connected to said
5 heat transfer system.

1 3. The dryer of claim 2 wherein said photovoltaic
2 module further comprises a battery constructed and arranged
3 to store electrical energy.

1 4. The dryer of claim 3 wherein said photovoltaic
2 module provides all of the electrical energy consumed by
3 said dryer.

1 5. The dryer of claim 1 wherein said heat transfer
2 system further comprises:
3 a first heat transfer circuit including a first pump
4 and a first heat transfer medium;
5 a second heat transfer circuit including a second
6 pump and a second heat transfer medium;
7 a first heat exchanger; and

8 wherein said first heat exchanger is in thermal
9 communication with said thermal collector via said first
10 heat transfer circuit and said first heat exchanger is in
11 thermal communication with said drying chamber via said
12 second heat transfer circuit such that heat is able to move
13 from said first heat transfer circuit to said second heat
14 transfer circuit.

1 6. The dryer of claim 5 wherein said heat transfer
2 system further comprises a second heat exchanger.

1 7. The dryer of claim 5 wherein said heat transfer
2 system further comprises a heat storage medium, said heat
3 storage medium being in thermal communication with said
4 drying chamber such that heat is able to move from said heat
5 storage medium to said second heat transfer circuit.

1 8. The dryer of claim 5 wherein said heat transfer
2 system further comprises an auxiliary heat source, said
3 auxiliary heat source being in thermal communication with
4 said drying chamber such that heat is able to move from said
5 auxiliary heat source to said second heat transfer circuit.

1 9. The dryer of claim 8 wherein the auxiliary heat
2 source is a furnace constructed and arranged to burn
3 biomass.

1 10. The dryer of claim 9 wherein said biomass is
2 coffee parchment.

1 11. The dryer of claim 5 wherein said first heat
2 transfer medium is water.

1 12. The dryer of claim 5 wherein said second heat
2 transfer medium is air.

1 13. The dryer of claim 5 further comprising a heat
2 storage medium in thermal communication with an auxiliary
3 heat source, said thermal collector, and said drying
4 chamber, wherein heat is able to move from said auxiliary
5 heat source to said heat storage medium, from said thermal
6 collector to said heat storage medium, and from said heat
7 storage medium to said drying chamber.

1 14. The dryer of claim 1 wherein said drying
2 chamber further comprises a heat exhaust port.

1 15. The dryer of claim 1 wherein said drying
2 chamber further comprises a moisture exhaust port.

1 16. The dryer of claim 1 further comprising:
2 an intake in fluid communication with the drying
3 chamber; and
4 a pump in fluid communication with said intake.

1 17. The dryer of claim 1 further comprising:
2 an auxiliary generator in electrical communication
3 with an electrical system of the dryer, the generator
4 capable of providing all electrical energy required to operate
5 the dryer.

1 18. The dryer of claim 17 wherein the generator is
2 capable of providing all electrical energy required to
3 operate all other coffee processing devices such that the
4 dryer is a component of an off-grid coffee processing
5 system.

1 19. The dryer of claim 17 wherein the generator is
2 an external combustion engine.

1 20. The dryer of claim 17 wherein the generator
2 operates according to the Stirling thermal cycle.

1 21. The dryer of claim 17 further comprising a heat
2 exchanger in thermal communication with an exhaust of the
3 generator and with the heat transfer system, the heat
4 exchanger constructed and arranged to transfer heat
5 exhausted from the generator to the heat transfer system.

1 22. A method for drying vegetable product in a
2 dryer comprising:
3 placing said vegetable product in a drying chamber;
4 collecting solar energy;
5 transforming said solar energy into heat energy;
6 transferring said heat energy into said drying
7 chamber; and
8 exhausting moisture from said drying chamber.

1 23. The method of claim 22 further comprising
2 heating said drying chamber to a temperature sufficiently
3 high to accelerate evaporation of moisture from said
4 vegetable product and sufficiently low to avoid adversely
5 affecting said vegetable product.

1 24. The method of claim 22 wherein said vegetable
2 product is coffee beans.

1 25. The method of claim 22 further comprising:
2 burning biomass within a furnace to produce
3 additional heat energy; and

4 transferring said additional heat energy from said
5 furnace to said drying chamber.

1 26. The method of claim 25 wherein said biomass is
2 coffee parchment.

1 27. The method of claim 22 further comprising:
2 storing a portion of said heat energy; and
3 transferring said portion to said drying chamber.

1 28. The method of claim 22 further comprising:
2 transforming solar energy into electrical energy;
3 and
4 using said electrical energy in transferring said
5 heat energy into said drying chamber.

1 29. The method of claim 22 wherein all electrical
2 energy and all said heat energy consumed by said dryer are
3 produced by collecting light from the sun and burning coffee
4 parchment.

1 30. The method of claim 22 further comprising:
2 removing dry vegetable product;
3 drying wet vegetable product while said dry
4 vegetable product is removed; and
5 adding additional wet vegetable product to replace
6 said dry vegetable product.

1 31. The method of claim 30 further comprising:
2 rotating said wet vegetable product into a first
3 space vacated by said dry vegetable product; and
4 rotating said additional wet vegetable product into
5 a second space vacated by said wet vegetable product.

32. A dryer for drying vegetable product, such as coffee beans, comprising:

a housing defining a cylindrical drying chamber, the housing having an outer wall extending around the drying chamber, the outer wall defining a plurality of perforations for intaking and exhausting fluid;

an infuser adjacent to the perforations for infusing fluid through the perforations; and

wherein the housing is constructed and arranged to rotate relative to the infuser.

33. The dryer of claim 32 wherein the infuser is periodically adjacent to first and second relative sides of the outer wall, the first and second sides capable of changing position as the housing rotates relative to the infuser, the first relative side being in a position for intaking fluid into the drying chamber when the second relative side is in a position for exhausting fluid from the drying chamber.

34. The dryer of claim 32 wherein the infuser is in thermal communication with a heat source for heating fluid to be infused into the drying chamber.

35. The dryer of claim 32 wherein the infuser comprises a pump in fluid communication with the drying chamber through the perforations.

36. A housing defining a drying chamber for drying vegetable product, such as coffee beans, the housing comprising:

a cylindrical wall extending around the drying chamber, opposing end walls at either end of the drying

6 chamber, a plurality of perforations located for intaking
7 and exhausting fluid, wherein the housing is constructed and
8 arranged to rotate about an axis.

1 37. The housing of claim 34 further comprising a
2 set of doors in the cylindrical wall to load and unload
3 vegetable product.

1 38. The housing of claim 36 further comprising a
2 set of baffles for mixing produce within the drying chamber,
3 the baffles extending from the inner surface of the
4 cylindrical wall.

1 39. A dryer for drying vegetable product, such as
2 coffee beans, comprising:
3 a housing having a drying chamber, the housing
4 having a fluid intake port and a fluid exhaust port located
5 along a fluid flow path of the drying chamber, the intake
6 and exhaust ports oriented such that the fluid flow path
7 includes a substantial component in the vertical direction;
8 and
9 a set of support members providing channels
10 substantially oriented in the direction of the fluid flow
11 path.

1 40. The dryer of claim 39 wherein the channels are
2 adjustable relative to the vertical direction.

1 41. The dryer of claim 39 wherein the housing
2 further comprises an entry port and an exit port, the entry
3 port located vertically upward relative to the exit port.

1 42. The dryer of claim 39 wherein the channels are
2 constructed and arranged to conduct produce from a higher
3 level relative to a ground level to a lower level relative
4 to the ground level.